SELECTED SOLUTIONS AND COMMENTS FOR TASKS
Grade 7 – Proportional Reasoning, Probability, and Statistics

Tasks are intended to serve different purposes. When appropriate, students are encouraged to make choices, think strategically, and explain their reasoning. This document contains answers to selected problems. When answers vary, we try to offer an example when possible. When not possible, we describe what a student response could look like. The solutions in this document are not meant to represent an exhaustive list of suitable answers.

A Special Diet (fractions, ratios, modeling real life situations)	
1	• Calories from protein to calories from fruits and vegetables is 4 : 3. • Calories from carbohydrates to calories from fat is 2 : 1. • Calories from fat and carbohydrates to calories from fruits and vegetables and protein is 3 : 7.
2	The calories from carbohydrates and fat is equivalent to the calories from fruits and vegetables. In general, 1:1 ratios represent relationships between equal parts.
3	Yes. Explanations will vary.
4	Protein: 1040 calories Fruits and vegetables: 780 calories Carbohydrates: 520 calories Fat: 260 calories
5	The total calories for the day will be 1250. 500 calories from protein, 375 calories from fruits and vegetables, 250 calories from carbohydrates, and 125 calories from fat.

Using Coupons (percent)	
1	Explanations will vary. If she wants to save the most money, she should use Coupon A on the mattress and Coupon C on the bed frame. Coupons B and D can be used on either of the sheets or the pillows for a total of $30 off those items.
2	Howard will save the most money if he uses Coupon A first to lower the price to $900. Then he should use Coupon B to lower the price to $810. Then he can use Coupons B and D in either order to lower the price to $780. Explanations will vary.

Minimum Wages (percent, modeling real life situations)	
1	Check graphs for accuracy. Descriptions will vary. There is definitely an increase from decade to decade. The pattern is relatively linear, but the last data point (2010, $7.25) does suggest a slight upward curve to the pattern.
2	The wage in 1960 increased 60% to 1970. The wage in 1970 increased about 94% to 1980. The wage in 1980 increased about 23% to 1990. The wage in 1990 increased about 36% to 2000. The wage in 2000 increased about 40% to 2010.
3	Answers will vary. The wage increase from 1970 to 1980 was the greatest percentage increase. The increase of $2.10 was the greatest dollar amount increase.
4	The increase from $7.25 to $10.10 is about 39%.
5	The cost of hamburgers has increased 500% since the 1960s. The minimum wage in 2010 is a 625% increase over the wages in 1960. In general, minimum wages have increased more than the cost of hamburgers. This means that people making minimum wage can buy more hamburgers today than minimum wage earners in 1960.
6	The cost of college has increased about 3000% since the 1960s. (In other words, college costs about 30 times as much as it did back then.) This increase in tuition is much greater than the increase in minimum wage. This means that college is not nearly as affordable as it once was. The economic impact of this fact is huge. It means that minimum wage earners cannot readily earn a college degree so they can increase their wages.
7	Answers will vary.

SELECTED SOLUTIONS AND COMMENTS FOR TASKS
Grade 7 – proportional reasoning, probability, and statistics continued

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Student Load (percent)	
1	Simple Interest Example: P = \$10,000; R = 0.04; T = 2 I = \$800 A = \$10,800. Cary has to pay Grandma Bobbie \$10,800 after 2 years if simple interest formulas are used. Compound Interest Example: Year 1 interest is \$400 (4% of \$10,000). Year 2 interest is \$416 (4% of \$10,400). Her total interest is \$816. Cary has to pay Grandma Bobbie \$10,816 after 2 years if compound interest formulas are used.
2	a. The interest is \$6000. The total amount is \$46,000.
	b. The total amount is \$46,305.

Create a Spinner Puzzle (probability)	
	Answers will vary.

Spinner Sums (probability)	
	Answers and explanations will vary. The theoretical probabilities below represent the likelihood of the sums of the results of two spins for each spinner. The sum is written in the parenthesis; the probability that sum occurs is expressed as a fraction. Students may express theoretical probabilities in an outcome grid. Outcomes for Spinner A: (2) $\frac{4}{16}$, (3) $\frac{4}{16}$, (4) $\frac{5}{16}$, (5) $\frac{2}{16}$, (6) $\frac{1}{16}$. Most likely outcome is a sum of 4 (31.25%). Notice that this is an “inverted” outcome distribution compared to Spinner C. In general, lesser sums are more likely than greater sums. Outcomes for Spinner B: (2) $\frac{1}{16}$, (3) $\frac{4}{16}$, (4) $\frac{6}{16}$, (5) $\frac{4}{16}$, (6) $\frac{1}{16}$. Most likely outcome is a sum of 4 (37.5%). Notice that this outcome distribution is symmetrical. Lesser sums are as equally likely as greater sums. Outcomes for Spinner C: (2) $\frac{1}{16}$, (3) $\frac{2}{16}$, (4) $\frac{5}{16}$, (5) $\frac{4}{16}$, (6) $\frac{4}{16}$ Most likely outcome is a sum of 4 (31.25%). Notice that this is an “inverted” outcome distribution compared to Spinner A. In general, greater sums are more likely than lesser sums.

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Grade 7 – proportional reasoning, probability, and statistics continued

Pascal's Triangle (probability)	
1	There are several patterns Pascal's Triangle so answers will vary. The most important pattern for students to see in order to do this task is that any number (other than 1) is the sum of the two numbers above it (to the left and to the right). Students must internalize this pattern to be able to complete the rest of the task.
2	There are many layers to this problem. The primary concept at the heart of this problem is that Pascal's Triangle can be useful for finding outcomes for a variety of probability problems. If two coins are flipped simultaneously, there are 4 outcomes: HH, HT, TH, TT If three coins are flipped simultaneously, there are 8 outcomes: HHH, HHT, HTH, HTT, THT, TTH, THH, TTT. The number of outcomes for 1, 2, and 3 coins equals the sum of the 1^{st}, 2^{nd}, and 3^{rd} row respectively. The 5^{th} row represents the possible outcomes if 5 coins were flipped (or if a coin was flipped 5 times). The total number of outcomes for 5 coins is 32. In general, the sum of *n*th row represents the possible outcomes for flipping *n* coins. The sum of the 9^{th} row is 512 so there are 512 possible outcomes.
3	Answers will vary.

The Cereal Box Problem (statistics / sampling)	
1	Predictions will vary, but it's a lot more than 6.
2	Answers will vary. A six-sided die works well for this simulation. A random number generator on a phone for numbers 1-6 will also work.
3	Data will vary.
4	Analysis will vary.
5	Conclusions will vary.